

## LIGHT SOURCE MODULE

### DESCRIPTION

#### BACKGROUND OF THE INVENTION

##### *Field of the Invention*

5           The present invention relates to a light source module, particularly to the light source module utilized in scanners.

##### *Background Description*

10           A scanner is the device to capture images and to transmit the captured analog signal into the digital mode which can be displayed, edited, stored and output by computers.

15           Referring to Figure 1, it is the schematic diagram of a known scanner. As shown in Figure 1, the scanner is mainly built up by CCD (Charge-Coupled Device) sensing units, a fluorescent lamp, a motor, a belt (or a driven worn gear set), an analog/digital signal converter (A/D Converter), a cover and a case.

20           The way that scanners capture images is as: first place the origin copy on the document glass (not shown in the drawing) and close the document

cover; then, with the software installed in the computer driving the motor, the belt is started to move the fluorescent lamp and to illuminate the origin copy; after the light reflection, the light  
5 beams are transmitted by a mirror to CCD sensing units; CCD sensing units can detect the varied intensity of the light beam reflected from the different areas of the origin copy and transform the intensity of the light beam into the varied  
10 intensity of the electric current; afterward the electric current is transmitted to A/D Converter, which is transforming the electric current's analog signal into the digital signal which can be recognized by the computers; finally the scanning  
15 programs which control the operation of the scanner read in all the digital signals and restructure them into a computer picture file.

The known scanner uses the fluorescent lamp to provide the light source needed while scanning;  
20 however, the light beams produced by the fluorescent lamp going through the lens group set up in the scanner causes the uneven distribution of intensity of light as shown in Figure 2; in other words, the light on two sides is weaker and that in the middle  
25 is stronger, and it will cause CCD sensing units receives the weak reflection from the two sides of the origin copy and the scan-completed file has the indistinct two sides even the big black area, further, the content of the image being unable to be

recognized leads the consequence of bad scan quality.

Thus, to develop a light source module for improving the technique stated as above is able to  
5 cost down and to reach the goal of significantly control of the intensity of light.

#### SUMMARY OF THE INVENTION

10 It is therefore an object of the present invention to provide to a light source module which is applied to the scanners. It can overcome the traditional scanner's drawbacks as the uneven  
15 distribution of the intensity of light caused by the light source from the fluorescent lamp, the indistinct image at two sides or big black area of the picture file, and the content of the image unable to be recognized.

According to the above objects, the generalized  
20 exemplary implementation of the present invention is to provide a light source module, which is applied to the photoelectric scanning device, offers the light required by the scanner for scanning an article; the light source module includes: a light  
25 emitting object: to produce the light source; a light guide object: to guide the light produced by the light emitting object; and several light reflection blocks: to be placed on the light guide

object, when the light illuminates the light guide  
object, these light reflection blocks reflect the  
light from the light emitting object and output to  
the article in order to keep the intensity of light  
5 in a certain status.

According to the conception of the present  
invention, the light emitting object is set on the  
side of the light guide object so that the light  
emitting object shoots the light to the light guide  
10 object from its side.

According to the conception of the present  
invention, the photoelectric scanning device is a  
scanner applied to capture the image of an article.  
The light guide object is a solid rod and is  
15 transparent.

According to the conception of the present  
invention, the light emitting object is a white  
light emitting diode.

According to the conception of the present  
20 invention, the light reflection blocks are placed  
against the light output side of the light guide  
rod.

According to the conception of the present  
invention, the light reflection blocks are the  
25 reflectors with a specific width and a specific

depth; with their width and depth and the distance from the light emitting object, there accomplishes the output of the consistent intensity of light.

5 According to the conception of the present invention, the reflection blocks are distributed relatively to the mid of the light guide rod.

10 According to the conception of the present invention, the depth of the light reflection blocks is in the central section of the light guide rod and close to the light output side of the light guide rod.

15 In order to meet the goals stated above, another light source module exemplary implementation of the present invention includes: a LED: to create the light source; a light guide object: to guide the light created by the LED; a light reflection block: a reflector with a specific width and a specific depth, which is placed against the light output side of the light guide object; with its width and depth and the distance from the LED, there accomplishes the output of the consistent intensity of light.

20 According to the conception of the present invention, the light guide object is a solid rod.

25 According to the conception of the present invention, the LED is a white LED.

According to the conception of the present invention, the reflection block is distributed relatively to the mid of the light guide rod.

5 According to the conception of the present invention, the depth of the light reflection block is in the central section of the light guide rod and close to the light output side of the light guide rod.

#### BRIEF DESCRIPTION OF THE DRAWINGS

10 The foregoing and other objects, aspects and advantages will be better understood from the following detailed description of a preferred embodiment of the invention with reference to the drawings, in which:

15 Figure 1 is a schematic diagram of a known scanner;

Figure 2 is the distribution chart of the light intensity of the fluorescent lamp;

20 Figure 3 is the diagram of the light source module of the first embodiment of the present invention;

Figure 4 is the diagram of the light intensity of the second embodiment;

25 Figure 5 is the diagram showing the reflection by the reflection structure of the present invention;

Figure 6 is the schematic diagram combined with

the light intensity pattern of the second embodiment of the present invention; and

Figure 7 is the schematic diagram combined with the light intensity pattern of the third embodiment of the present invention; and

#### DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

Figure 3 is the diagram showing the first embodiment of the present invention. The light source module of the present invention consists of a LED (Light Emitting Diode) 31, a light guide rod 32 and several light reflection structures 33, 34. It can be applied to a photoelectric scanning device for the purpose of offering the light source needed to scan an article or a document. With the arrangement of the light reflection structures, the intensity of light from the source to the article can be adjusted. The photoelectric scanning device is a scanner, but without limits.

In the light source module of the present invention, the emitting unit is the light emitting diode (LED) 31, which is set on the side of the light guide rod 32, thus the LED 31 projects light to the side of the light guide rod 32. If LEDs are set on both sides of the light guide rod, it certainly brings out a better luminosity.

The light guide rod 32 is made of the common material as a light guide plate in the TFT display industry, utilized to guide the light generated by the LED 31; the light reflection structures 33, 34 are set up on the light guide rod 32, the reflection surfaces are with the varied width (as Legend "a"), and the varied depth (or height as Legend "b"). With the different width and depth of the light reflection structures, there accomplishes the output of the consistent intensity of light. Hence, from the design point of view, the distribution and the property of the light reflection structures can be adjusted and arranged to the first light reflection structure 33 and the second light reflection structure 34 shown in Figure 3.

Further in Figure3, the second light reflection structure 34 is away from the LED and its depth of is relatively deep, so the intensity of light in the mid of the light guide rod 32 is weaker, it can effectively make up the aberration caused by the traditional lenses group application on the scanner; meanwhile, to set the first light reflection structure 33 on a proper place can decrease the output of the intensity of light from the light source module while approaching the middle. Therefore, the application of the present invention is stated as: by adjusting the parameters of the arrangement, distribution, width and depth of the light reflection structures, the light source module



is capable of providing a specific intensity pattern of the output of light source; it cannot only compensate the attenuation of the intensity of light from the typical image capturing module but also be applied to the product with a request of the output of the special intensity of light. The arrangement as shown in Figure 4, for example, is able to enhance the light source on both two sides. Therefore, it improves the property and performance of the prior known optical lens module.

In regard to the light improvement and the design of the output of the consistent intensity of the light source module of the present invention, the theory, as shown in Figure 5, is to utilize reflection surface 51 to guide the reflection to the light output side, so the angle and the depth of the reflection surface 51 are able to control the properties and patterns of the intensity of light reinforced by the reflection structure; similarly, the length and width of the light guide surface 52 are controllable in the design phase. It makes the output from the light guide surface more even. In the present invention, the light guide surface is relatively parallel with the light output side; however, it can be designed with a small angle to keep a bit distance from the reflection surface 51. Again, as shown in Figure 5, in case the light source (as LED) is set on both sides of the light guide rod, the light reflection structures can be

set up from the relative central point to both sides. Unless there is other requirement about the intensity of light source module, the unsymmetrical distribution can be adopted in order to perform the special pattern of intensity further to compensate the optics physics lacks of optical lens group, refer to Figure 7.

Figure 6 is the diagram of the second embodiment of the present invention. The height of the light reflection surface 61 is extremely small, but the quantity of the reflection surface is a bit more, relatively, the light guide surfaces 62 are evenly distributed according to the light output side 63. The effect of such light source modules is that the intensity of light output side would be gentle because the more the light reflection surface 61 and light guide surface 62 are distributed the better the consistency of the pattern of intensity. Contrarily, upon the request of the special light output, the reflector's width and depth are adjustable in the reflection structure of the light source module in the present invention in order to meet the request of the special intensity of light. Refer to Figure 7 of the third embodiment for the unsymmetrical distribution of the patten of intensity.

Besides, the light emitting objects as above can be set on the both sides of the light guide

stuff for the purposes of the high intensity of  
light or the need to balance the intensity of light.  
Plus, the light guide stuff shown in the drawing is  
a solid rod, which can be made of the other  
5 materials, or be the other shapes such cylindrical  
hollow object, semicircle, arc and so on. Moreover,  
the light guide structure can be built up inside of  
the light guide object to support the more  
consistent light guiding to the light guide object  
10 or rod, and it also assists the light source device  
of the present invention in better controlling of  
the intensity of light.

Surely, the LED in the light source module of  
the present invention has the other alternatives as  
15 the white light LED, red light LED, green light LED,  
blue light LED or even their combination.

The light source module of the present  
invention, with setting the reflection structures on  
the light output side (not shown in the drawing) of  
20 the light guide object or on the light input side,  
it's indeed to keep the consistently distributed  
intensity of the light illuminating to the scanner  
and further to solve the drawbacks of the known  
techniques. In addition, by combining the different  
25 types of reflection structures or adjusting the  
location and the density of the reflection  
structures distributed on the light guide plate, it  
can control the distribution of the intensity of

light output from the light source to meet the requirements upon the various photoelectric scanning devices.

5           Although preferred embodiments of the present invention have been described in the forgoing description and illustrated in the accompanying drawings, it will be understood that the invention is not limited to the embodiments disclosed, but is capable of numerous rearrangements, modifications, 10 and substituting of parts and elements without departing from the spirit and scope of the invention. Accordingly, the present invention is intended to encompass such rearrangements, modifications, and substitutions of parts and 15 elements as fall within the scope of the appended claims.